United States Patent [19]

Bakker

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[54] **PAPER ROLL REWINDER**

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[30] **Foreign Application Priority Data**

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[51] **Int. Cl.**[3] **B41J 15/16;** B65H 17/02

[52] **U.S. Cl.** ..... **242/67.3 R;** 242/68.4; 235/58 CF; 400/614

[58] **Field of Search** ..... 242/67.3 R, 67.1 R, 242/68.4, 67.1 D; 400/613, 614, 617; 235/58 CF

[56] **References Cited**

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[57] **ABSTRACT**

There is provided an apparatus for allowing a paper tape to be unwound from a first roll by a printing unit, and for simultaneously rewinding the paper tape on a second roll. Each roll includes a hollow cylindrical core. The apparatus includes a low friction cylindrical axle means for positioning within the hollow core of the second roll, and alignment means for maintaining the axle means such that its axis remains parallel with the axis of the second roll, and for keeping the two rolls laterally aligned. Retention means are also provided for keeping the two rolls together, the retention means preferably including an elastic cord member adapted to pass in a closed loop through the hollow core of the first roll and through a central opening in the axle means positioned in the hollow core of the second roll.

3 Claims, 5 Drawing Figures

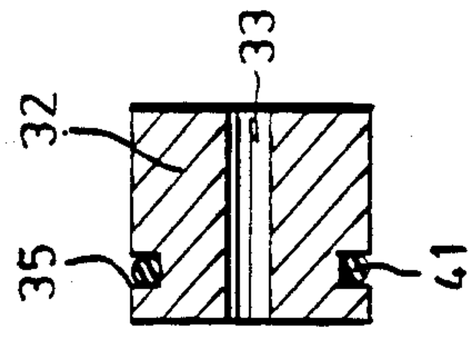

FIG. 4

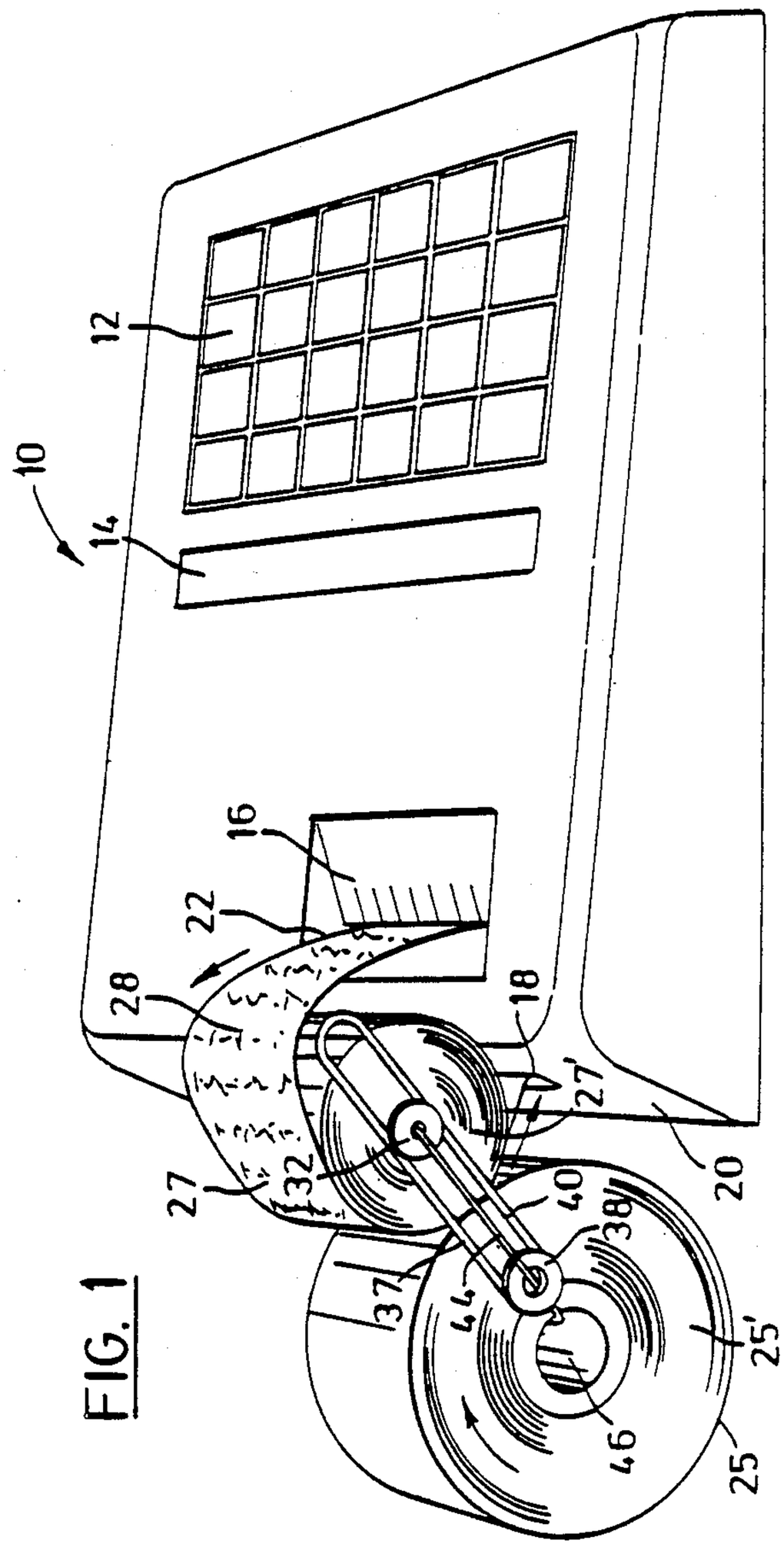

FIG. 1

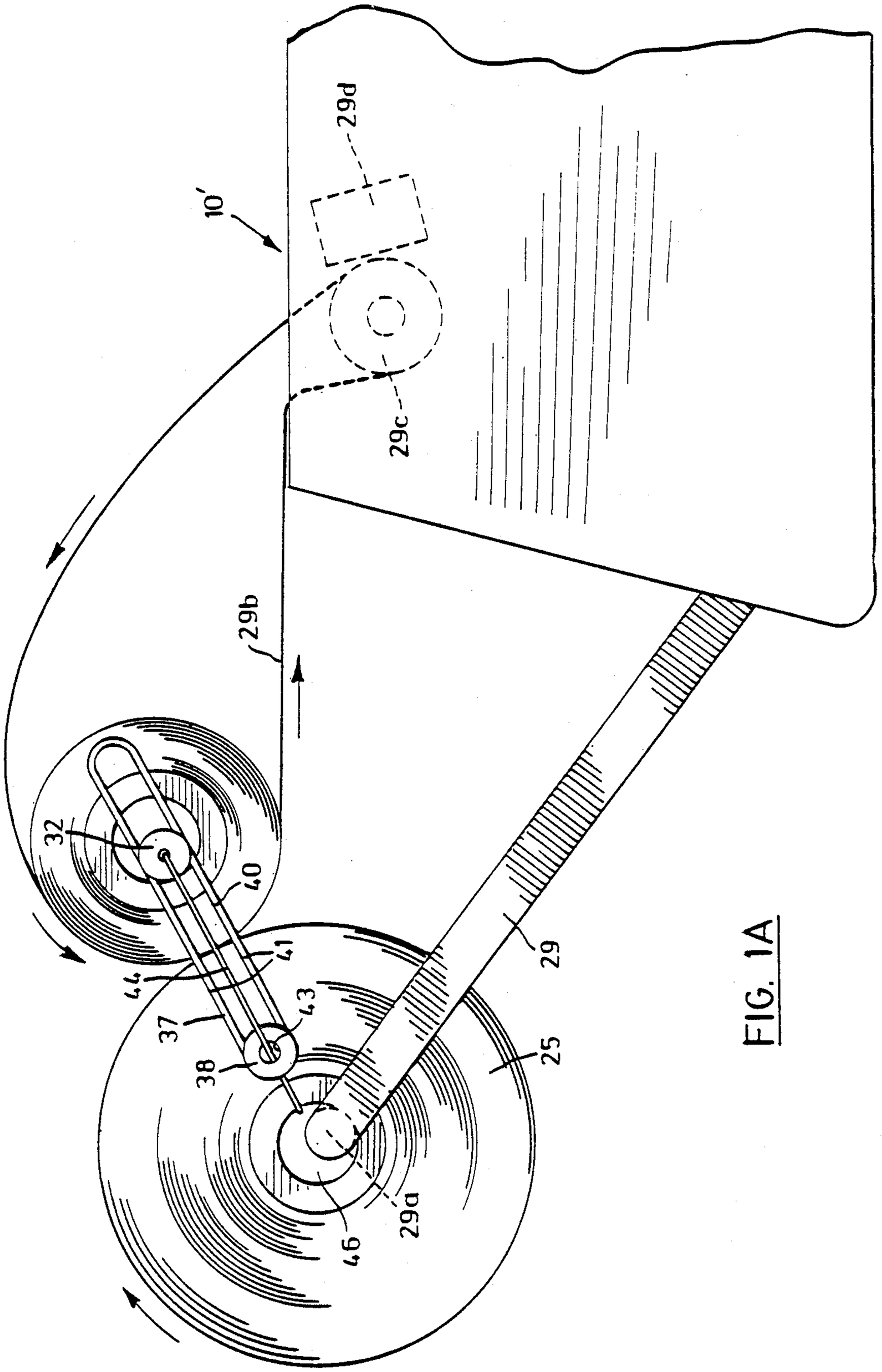

FIG. 1A

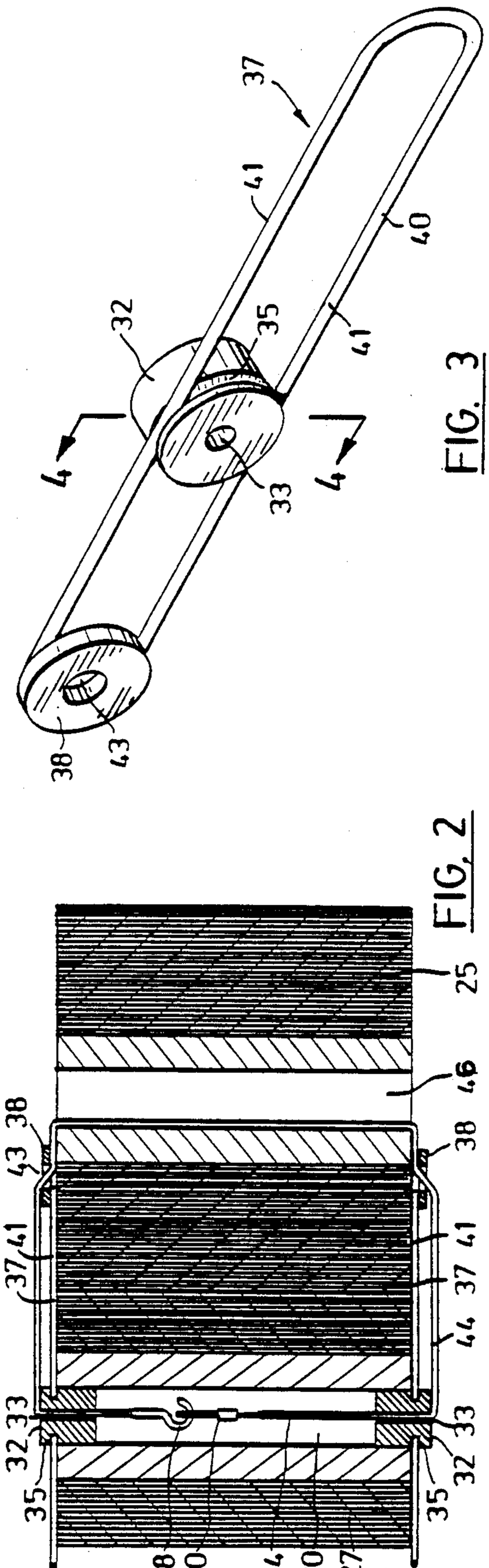
37
41
40
32
35
41
4
4
33
38
43

FIG. 3

25
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38
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37
41
37
44
33
32
33
32
35
35
48
50
44
30
27

FIG. 2

PAPER ROLL REWINDER

FIELD OF THE INVENTION

The present invention relates to a paper rolling system for feeding paper to a printing unit and for rewinding it so that it can be fed again into the printing unit, in order that the latter can print the unused side of the paper tape.

BACKGROUND OF THE INVENTION

It is well known that printing units such as adding machines operate with the use of paper tape that is fed through the unit, the paper tape being unwound from a roll of the paper tape with the help of automatic mechanisms in the unit. In operation, the printing unit will print on one side of the paper tape, and then index the printed tape outwardly while drawing further tape from the source. It is common experience that the printed paper tape produced by the printing unit forms a long, uncontrolled and cumbersome strip which is generally ripped off and discarded by the operator.

There are three significant disadvantages to this prior art procedure in regard to the paper tape. In the first place, it is difficult and cumbersome to store the individually ripped-off pieces of paper tape in the event that the operator wishes to keep a good record of the material printed on the tape. Secondly, conventional systems such as the printing system described above make use of only one side of the paper tape, because the machine is adapted to print on only one side of the tape. Thirdly, the machine's paper roll holder usually consists of arms and an axle. In the event of this breaking, there is no simple, inexpensive method for rendering the machine operative again.

It would be of advantage to provide a system by which the tape could be printed on both sides, and the attainment of this advantage is one of the aims of the present invention.

GENERAL DESCRIPTION OF THIS INVENTION

Accordingly, this invention provides an apparatus for allowing a paper tape to be unwound from a first roll by a printing unit, and for simultaneously rewinding the paper tape on a second roll. Each roll includes a hollow cylindrical core. The apparatus includes a low-friction cylindrical axle means for positioning within the hollow core of the second roll, and also incorporates alignment means for maintaining the axle means such that its axis remains parallel with the axis of the second roll, and for keeping the two rolls laterally aligned. Finally, the apparatus includes retention means for keeping the two rolls together. The retention means including an elastic cord member which is adapted to pass in a closed loope through the hollow core of the first roll and through a central opening in the axle means positioned in the hollow core of the second roll.

GENERAL DESCRIPTION OF THE DRAWINGS

One embodiment of this invention is illustrated in the accompanying drawings, in which like numerals denote like parts throughout the several views, and in which:

FIG. **1** is a perspective view of a typical printer calculator with which the apparatus of this invention can be used.

FIG. **1A** is an elevational view of the rear end of another form of typical printer calculator, with which the apparatus of this invention can also be used;

FIG. **2** is an axial sectional view taken through the axes of the two paper rolls of the apparatus of this invention;

FIG. **3** is a perspective view of one component of the apparatus of this invention; and

FIG. **4** is an axial sectional view taken at the line **4—4** in FIG. **3**.

DETAILED DESCRIPTION OF THE DRAWINGS

In FIG. **1**, a printer-calculator **10** is illustrated, which includes a keyboard **12**, an electronic display **14**, and a window **16** under which the printing takes place. The printer-calculator **10** is one which is adapted to draw paper tape into itself through a slot **18** in its back wall **20**, print numerals or other indicia on one side of the tape, and then feed the printed tape out of the unit at the rear edge **22** of the window **16**. Under conventional practice, a roll of unused paper tape would be provided, fed through the printing unit, and then as the printer-calculator passed printed tape out along one edge of the window **16**, the exiting tape would merely accumulate in a pile, possibly being torn off from time to time by the operator and discarded or filed.

In FIG. **1**, a first roll **25** of paper tape is illustrated in juxtaposition against the back wall **20** of the printer-calculator **10**.

In the arrangement shown in FIG. **1**, a second roll **27**, constituting a rewinding roll, is also provided. As can be seen, the second roll **27** is juxtaposed against the first roll **25**, parallel with the same, and in lateral alignment. The term "lateral alignment", as used herein and in the appended claims, refers to a situation in which the rolls **25** and **27** are in alignment laterally of their axes. More specifically, when the two rolls **25** and **27** are in lateral alignment, the end face **25'** of the roll **25** and the end face **27'** of the roll **27** are coplanar. Since the two rolls **25** and **27** are the same length, the other ends would also be coplanar when the rolls are in lateral alignment. The roll **27** is located between the printer-calculator **10** and the roll **25**, effectively resting in a "recess" provided between them. This would be the position of roll **25** if the machine were of the type where the paper roll holder is inside the machine housing, thus limiting access. The invention is constructed so that it will also function in conjunction with paper roll holders that hold the paper outside the machine housing, as in FIG. **1A**.

As can be further seen in FIG. **1**, the printed portion **28** of tape which is exiting from the printer-calculator **10** under the rear edge of the window **16** loops upwardly and then passes down between the two rolls **25** and **27**, to be wound around the second roll **27**. As the printer-calculator **10** draws tape from the first roll **25** into itself through the slot **18**, the first roll **25** is caused to rotate in the clockwise direction as seen in FIG. **1**. The second roll **27** is in frictional pressure contact with the first roll **25**, through a mechanism shortly to be described, and thus the clockwise rotation of the first roll **25** will induce a counter-clockwise rotation of the second roll **27**, as viewed in FIG. **1**. The peripheral speeds of rotation of the two rolls will remain the same, and therefore the printed tape **28** will be wound up around the second roll **27** at substantially the same rate

as tape is drawn off the first roll **25** through the slot **18** and into the printer-calculator **10**.

It will also be understood, from looking at FIG. **1**, that the tape **28** being ejected from the printer-calculator **10**, having the printed side uppermost, will be wound around the second roll **27** with the printed side outwardly. When the entirety of the first roll **25** has passed through the printer-calculator **10** and has been wound upon the second roll **27**, then replacement of the first roll **25** with the second roll **27** will allow the tape to be fed again into the slot **18**, the unprinted side being presented to the printer under the window **16**. Thus, both sides of the paper tape can be fully utilized by the machine.

Attention is now directed to FIG. **1A**, which shows a variation for the construction of the rearward end of a printer-calculator **10'**. As can be seen, a pair of roll holder arms **29** (only one visible in FIG. **1A**) extend rearwardly and upwardly from the back of the printer-calculator **10'**, and support a shaft **29***a* adapted to extend through the centre of the roll **25**. As in FIG. **1**, the roll **27** is situated roughly between the roll **25** and the rearward portion of the printer-calculator **10'**, and slightly above. In effect, the roll **27** rests downwardly on the portion **29***b* of tape which is coming off the roll **25**, and which is feeding into the top rear of the printer-calculator **10'**. It will be noted that the printer-calculator **10'** differs from that shown at **10** in FIG. **1**, in that there is no entry slot **18** for the tape, but rather the tape enters the printer-calculator **10'** at the top, very close to the position where the tape exits the printer-calculator **10'**.

Shown in broken lines in FIG. **1A** is a standard printing roll **29***c*, and an adjacent printing device **29***d*, for example a thermal printer.

Attention is now directed to all figures simultaneously, for a description of the mechanism which retains the two rolls **25** and **27** in frictional contact, and keeps them laterally aligned. The mechanism to be described also promotes axial alignment between the two rolls **25** and **27**, although this latter condition is promoted by the fact that both rolls **25** and **27** rest against the surface which supports the printer-calculator **10**.

There is firstly provided a low-friction, cylindrical axle means adapted to be positioned within the hollow core **30** of the second roll **27**. The arrangement is best seen in FIG. **2**, from which it is evident that the low-friction axle means consists of two stub axles **32**, each having a diameter allowing it to slip easily within the open core **30** of the second roll **27**, and each having an axial bore **33**, the bores **33** being aligned with each other in the condition shown in FIG. **2**.

Furthermore, alignment means are provided for maintaining the stub axles **32** in positions such that they are coaxial, and such that they have their axes parallel with the axis of the second roll **27**. The alignment means includes the provision of an annular gallery **35** (see FIGS. **3** and **4**) around each stub axle. There are also provided two members **37** which are adapted to lodge in the respective galleries, and to extend perpendicularly to the axes of the stub axles in the direction of the first roll **25**. Each member **37** is adapted to be juxtaposed against the respective end of both rolls, thus maintaining the rolls in lateral alignment, as defined earlier.

More specifically, each member **37** includes a washer portion **38** at one end, and a loop of wire **40** extending from the washer portion **38** to define two parallel straight wire portions **41**, which are adapted to lodge in the gallery **35** of the respective stub axle **32**. The washer portion **38** is offset from the ends of the straight wire portions **41**, as best seen in FIG. **2**. The washer portion **38** has a central aperture **43**.

As best seen in FIGS. **1** and **2**, an elastic cord member **44** is provided, and this passes in a closed loop through the hollow core **46** of the first roll **25**, through the central bores **33** in the stub axles **32**, and thence through the hollow centre core **30** of the second roll **27**.

To permit attachment and detachment of the apparatus with respect to the rolls **25** and **27**, the elastic cord member **41** may be in the form of a single length of elastic material, having at one end a hook **48** and at the other end an eyelet **50**, these latter being such that they may be connected together or disconnected as desired.

The particular construction shown in FIG. **3** is of advantage because it allows the apparatus to be adapted to any size of rolls, within reason. It will be realized that the member **37** will be able to slide through the gallery **35** of the stub axle **32**, thereby to allow adjustment of the distance between the stub axle **32** and the washer portion **38**.

In operation, it is important to adjust the position of the member **37** so that it spans across the junction between the two rolls **25** and **27**. As can be seen in FIG. **2**, the elastic cord member is fed through the aperture **43** in each of the washer portions **38**, the elastic cord member passing from the core of the first roll **25** to the inside of the washer portion **38**, thence outwardly through the aperture **43** to the outside of the washer portion **38**, thence along and parallel to the member **37** to the point of entrance into the bore **33** of the corresponding stub axle **32**. This construction allows the elastic to function in such a way that it urges the member **37** to remain lightly in juxtaposed contact with the end faces of both rolls **25** and **27**, thus promoting lateral alignment without producing excessive friction which might interfere with the rotation of the second roll **27**. To disconnect the elastic core member, the stub axle **32** is withdrawn out of its connection with the leftward core in FIG. **2**, and this simply pulls the portions **48** and **50** out into the open where they can be disengaged. The reverse process is used to connect them together.

It will be readily understood from the above description that the paper rolling system herein disclosed not only provides for rewinding of used paper tape for storage purposes, but also provides a reversal of the paper so that the second roll **27** may be substituted for the first roll **25** after the paper on the first roll **25** has been exhausted, thus permitting the tape to go through the printer-calculator on a second pass with its unprinted side exposed to the printing unit. Thus, the usage of the paper is doubled, and wastage is halved.

While a particular embodiment of this invention has been described and illustrated in this disclosure and the accompanying drawings, it will be evident that variations may be made thereto, without departing from the spirit and scope of the invention as defined herein and as set forth in the accompanying claims.

I claim:

1. Apparatus for allowing a paper tape to be unwound from a first roll by a printing unit, and for simultaneously rewinding the paper tape on a second roll, each roll including a hollow cylindrical core, the apparatus comprising:

low-friction cylindrical axle means for positioning within the hollow core of the second roll,

alignment means for maintaining said axle means such that the axis of the axle means remains parallel with the axis of the second roll, and for keeping the two rolls laterally aligned,

and retention means for keeping the two rolls together, said retention means including an elastic cord member adapted to pass in a closed loop through the hollow core of the first roll, between the two rolls, and through a central opening in the axle means positioned in the hollow core of the second roll,

the axle means including two stub axles, each adapted to enter one end of the hollow core of the second roll, and each having an axial bore through which the elastic cord member passes,

the alignment means including an annular gallery around each stub axle, and for each stub axle a member adapted to lodge in the gallery and to extend perpendicular to the axis of the stub axle, the member being juxtaposed and urged against the respective end of both rolls by the elastic cord member, thus maintaining the rolls laterally aligned, the two members being separate and independent of one another, and linked only by the elastic cord member.

2. The apparatus claimed in claim **1**, in which the member includes a washer portion at one end, and a loop of wire extending from said washer portion to define two parallel straight wire portions which are adapted to lodge in the gallery of a stub axle, the washer portion being offset from the ends of the straight wire portions.

3. The apparatus claimed in claim **2**, in which the elastic cord member includes a releasable connection for attaching the cord member through the rolls and for detaching it therefrom.

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